T2-A2 Flash flooding case studies

To improve predictions and the communication of uncertainty

Project wrap-up – NHRA Forum June 2025

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Outline

- What we did
- What we found
- What we learned

Australian Government
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What we did: project overview

- → Flash flood events are complex
  - They occur **quickly**, can be **high-impact** and often have **high uncertainty**
- → To improve services, it is important to understand the **current state**
- → Two approaches used:
  - **Case study analysis** – examining the full warning value chain for three events
  - A **public survey** – examining understanding of flash flooding and certainty around its occurrence

Study questions

Is the uncertainty around the forecast communicated effectively?

Is 'flash flooding' well understood by the community and emergency services?

Is the balance between lead time and uncertainty right?

Is the fidelity of information changed as it passes between agencies and to the public?

What we did: project components

Case studies

Three case studies of recent flash flood events

Tested the value chain approach and tools developed by the WMO HiWeather project

Survey

Baseline assessment

N=1235

31% EM sector
69% general public

55% flood experience
45% no flood experience

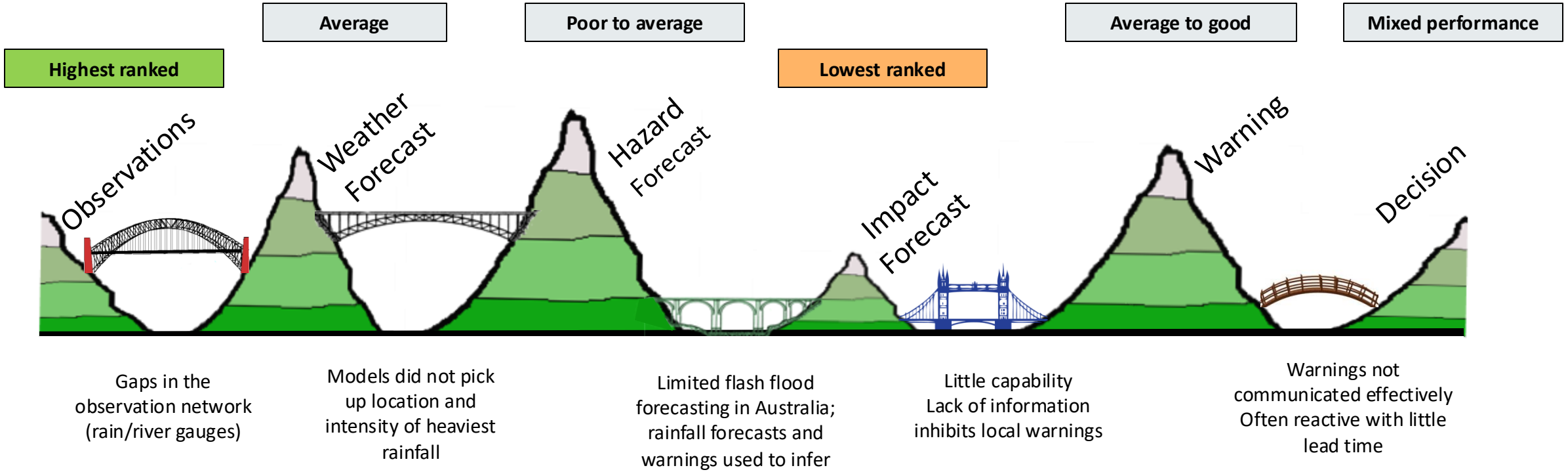
Collaboration and engagement

EM sector stakeholders
Case study workshops
1:1 interviews
AFAC FSWISTG

9 presentations including end of project webinar

What we found: the flash flood warning value chain is complex

- → Value chain includes many actors, information nodes, linkages and information flows
- → Case studies were diverse but had similar strengths and weaknesses
- → Several improvements in recent years – arrangements, flood intelligence, AWS implementation



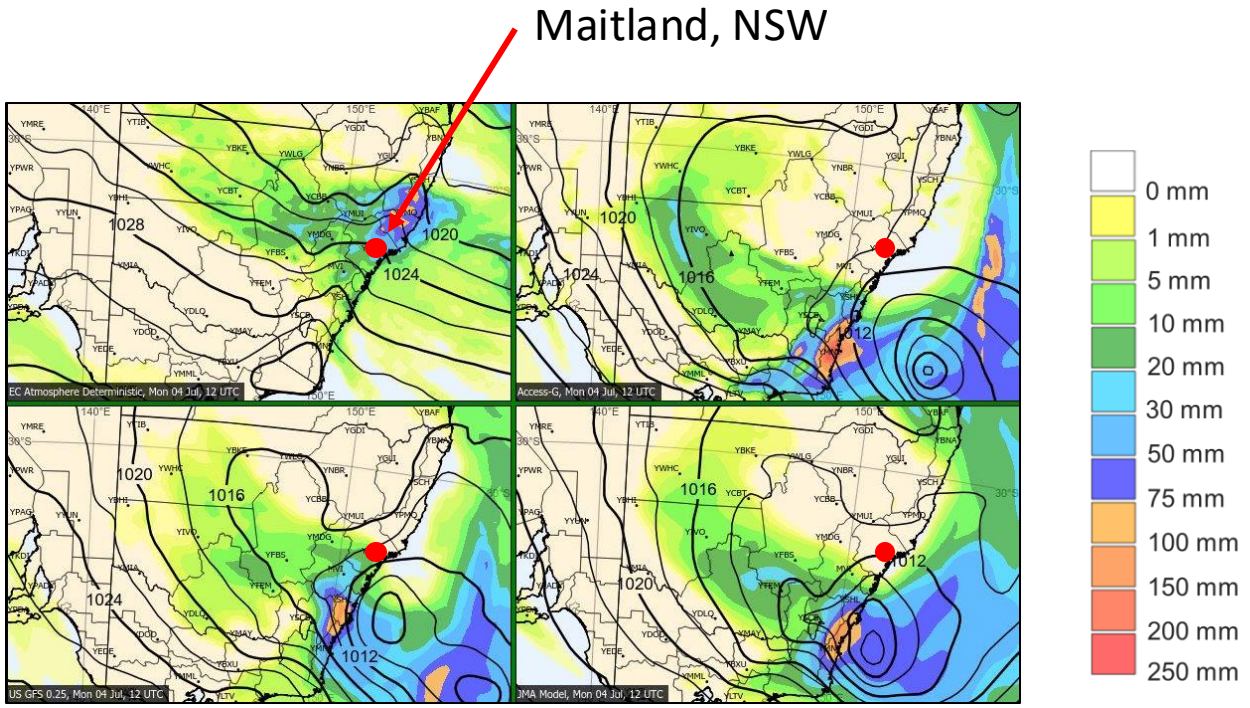
What we found: uncertainty affects the entire value chain

→ Each component of the e.g

- rainfall forecasts often vary significantly ahead of an event
- Local influence on landscape response
- Human response – time/day

→ The value of information can be enhanced or reduced by the way it is communicated

The challenge is to effectively communicate uncertainty



High variation in rainfall forecasts during the Wallis Creek case study had flow-on effects

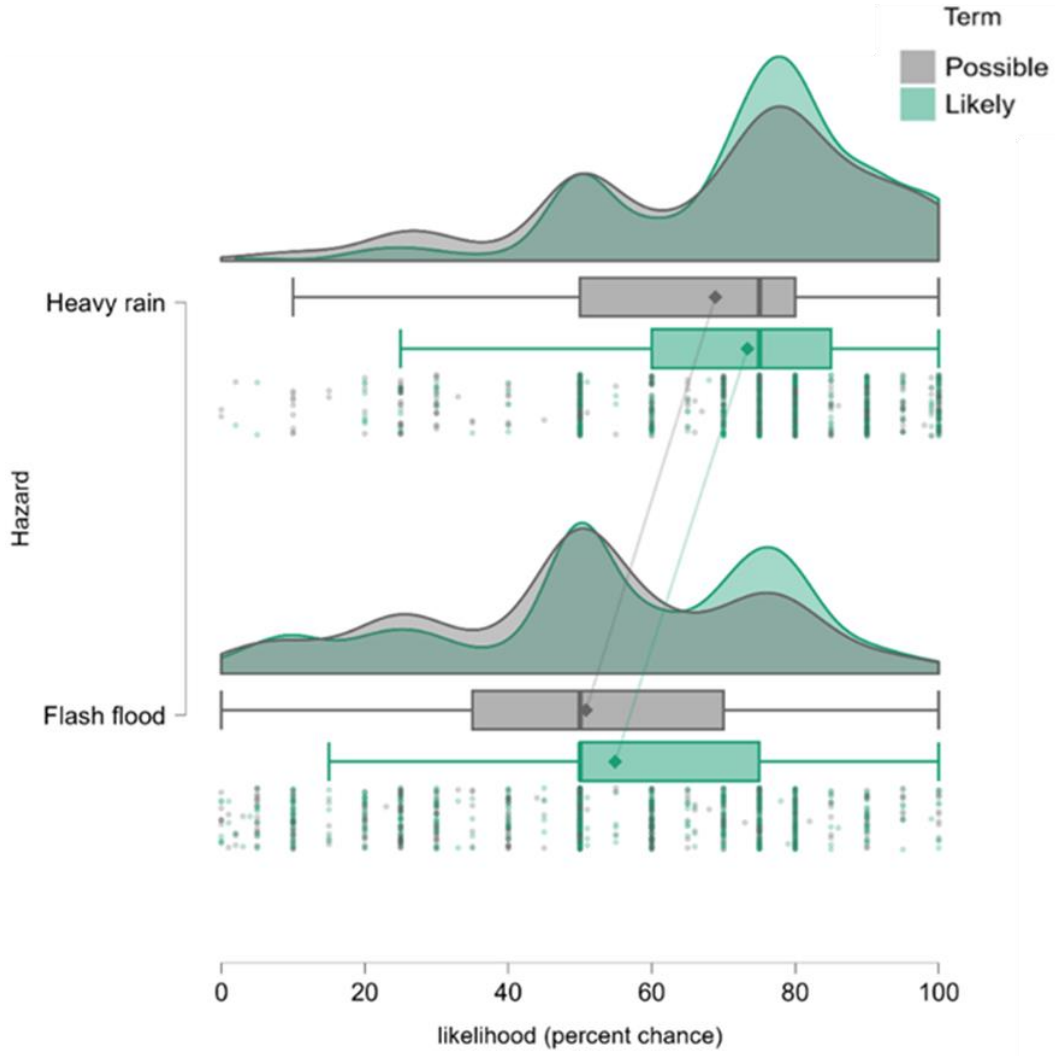
What we found: there are issues with communication

→ Flash flooding is not well understood

- Participants knew some definitions and causes of flash flood, but also held incorrect knowledge
- Little difference in knowledge between public and EM

→ Terminology is confusing

- Uncertainty terms, such as 'likely' or 'possible', are understood differently
- Limited understanding of the difference between 'heavy' and 'intense' rain



When asked to interpret a warning message, responses varied widely

Severe Weather Warning message

"HEAVY RAIN which may lead to FLASH FLOODING is possible"

What we learned: project reflections

Worked well
Stakeholder collaboration and involvement
Evaluation of the end-to-end warning system
Value chain approach
Baseline assessment

Scope for improvement
Public education about flash flood risk
Communication strategies
Co-designed decision support
Rainfall forecast specificity

Suggestions for the future:

- Evaluate effectiveness of recent improvements
- Review the data collection methods – workshops/interviews/survey
- Capture multiple states and events or do deeper dives into specific events
- Start the value chain evaluation as soon as possible

References

- Ebert, B, Perrels, A, Mooney, C, Hoffmann, D, Tupper, A, Mills, B, Pástor-Paz, J, Liang, X, Msemo, H, Da Costa, J & Lazo, J 2024, **Value chain approaches to describe, improve, value, and co-design early warning systems.**

- Ebert, EE, Hoffmann, D & Mooney, C 2024-a, **Warning Value Chain Questionnaire and Guide**, Zenodo, viewed 29 May 2025, https://doi.org/10.5281/zenodo.13966993

- HIWeather warning value chain project website (June 2023)

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Thankyou

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